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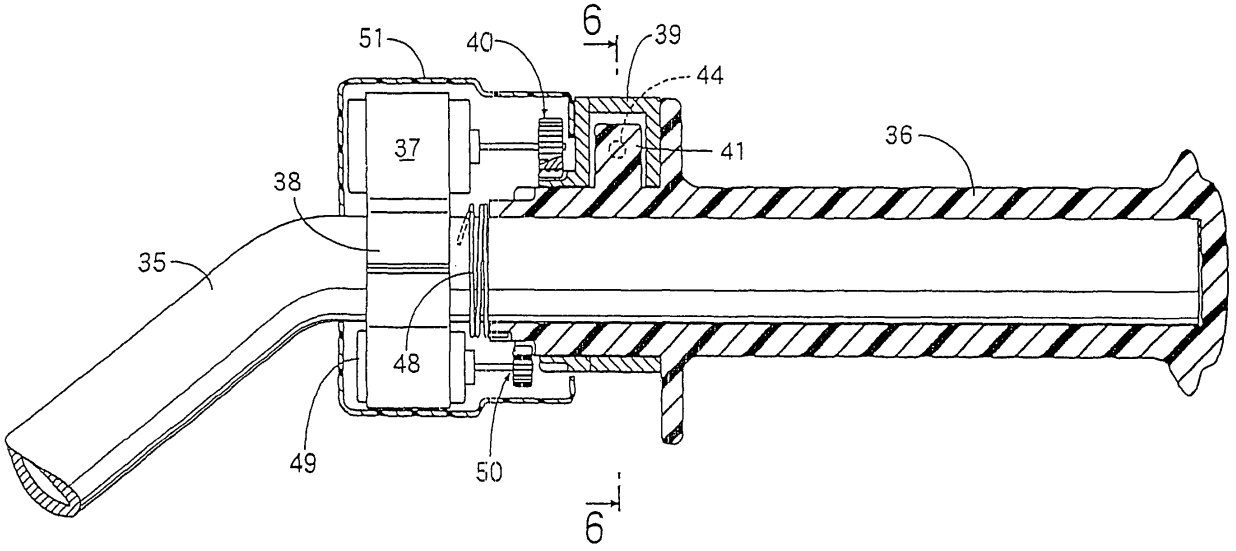
(54) Saddle type vehicle

(57) Object: In a saddle type vehicle in which a valve shaft to which a throttle valve is secured is rotatably supported on an air intake path forming body, and an actuator having a valve shaft driving electric motor which is moved in response to the turning operation of a throttle grip (36) is connected to an end of the valve shaft, so that the rotational movement of the valve shaft is fed back to the throttle grip (36), laying of a cable is not necessary, and the rotational movement of the valve shaft driven by the valve shaft driving electric motor can be fed back to the throttle grip (36).

Solving Means: A grip driving electric motor (37) which is moved by the amount of movement according to the amount of rotation of the valve shaft in response to the operation of the actuator is disposed on the steering handle (35), and is interlocked and connected to the throttle grip (36).

FIG. 5



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Description

[0001] The present invention relates to a saddle type vehicle including an air intake path forming body that forms an air intake path, a valve shaft to which a butterfly-shaped throttle valve for controlling the opening of the air intake path is secured, the valve shaft being rotatably supported on the air intake path forming body, and an actuator having a valve shaft driving electric motor which is moved in response to the turning operation of a throttle grip mounted to an end of a bar-shaped steering handle so as to be capable of turning, the actuator being connected to an end of the valve shaft so as to rotate the valve shaft, so that the rotational movement of the valve shaft is fed back to the throttle grip.

[0002] In a motorcycle as a saddle type vehicle, the one in which a cable wound around a throttle drum to be mounted to a valve shaft is connected to a throttle grip so as to feed back the rotational movement of the valve shaft to be driven to rotate by a valve shaft driving electric motor is disclosed, for example, in JP-A-2001-246960 (Patent Document 1).

[0003] According to the motorcycle disclosed in Patent Document 1, it is necessary to lay a cable between a throttle drum to be mounted to a valve shaft and a throttle grip.

[0004] In view of such circumstances, it is an object of the present invention to provide a saddle type vehicle in which laying of a cable is not necessary, and the rotational movement of a valve shaft driven to rotate by a valve shaft driving electric motor can be fed back to a throttle grip.

[0005] In order to achieve the object described above, the invention according to Claim 1 is a saddle type vehicle including an air intake path forming body that forms an air intake path, a valve shaft to which a butterfly-shaped throttle valve for controlling the opening of the air intake path is secured, the valve shaft being rotatably supported on the air intake path forming body, and an actuator having a valve shaft driving electric motor which is moved in response to the turning operation of a throttle grip mounted to an end of a bar-shaped steering handle so as to be capable of turning, the actuator being connected to an end of the valve shaft so as to rotate the valve shaft, so that the rotational movement of the valve shaft is fed back to the throttle grip, characterized in that a grip driving electric motor that is moved by the amount of movement according to the amount of rotation of the valve shaft in response to the movement of the actuator is disposed on the steering handle and is interlocked and connected to the throttle grip.

[0006] In addition to the configuration of the invention according to Claim 1, the invention according to Claim 2 includes an automatic cruise selection switch for switching between an automatic cruising state and a non automatic cruising state, and a control unit for controlling the movement of the valve shaft driving electric motor so as to maintain the vehicle speed constant in response to selection of the automatic cruising state by the automatic cruise selection switch.

[0007] In addition to the configuration of the invention according to Claim 2, the invention according to Claim 3 includes a rotating member that rotates about an identical axial line to the throttle grip by transmission of a power from the grip driving electric motor, the rotating member being mounted to the steering handle so as to cause the throttle grip to follow the rotation of the rotating member, a cancel switch mounted to the rotating member, the cancel switch detecting that the throttle grip is rotated in the throttle closing direction with respect to the rotating member, wherein the control unit releases the automatic cruising state in response to the detection of the relative rotation of the throttle grip in the throttle closing direction by the cancel switch in the automatic cruising state.

[0008] According to the invention of Claim 1, since the throttle grip is driven to rotate by the grip driving electric motor in response to the rotation of the valve shaft by a drive force demonstrated by the valve shaft driving electric motor, the cable is not necessary, and hence laying of the cable is not necessary.

[0009] According to the invention of Claim 2, the saddle type vehicle can be traveled at a constant vehicle speed by selecting the automatic cruising state and, in addition, the load state of an internal combustion engine during the automatic cruising can be recognized by the rotation of the throttle grip. Therefore, a desirable feeling of travel can be obtained.

[0010] In addition, according to the invention of Claim 3, the rotation of the throttle grip for releasing the automatic cruising state can be detected by the cancel switch in good response in a structure without the interposition of the cable or the like.

[0011] An embodiment of the present invention will be described on the basis of an example of the present invention shown in the drawings, in which:

Fig. 1 is a side view of a principal portion of a motorcycle.

Fig. 2 is a plan view, viewed from the direction of an arrow 2 in Fig. 1 in a state in which an air cleaner is omitted.

Fig. 3 is a front view of an intake air control device viewed from the direction of an arrow 3 in Fig. 2.

Fig. 4 is a cross-sectional view taken along the line 4-4 in Fig. 3.

Fig. 5 is a vertical cross-sectional view of a steering handle in the vicinity of a throttle grip.

Fig. 6 is a cross-sectional view taken along the line 6-6 in Fig. 5.

Fig. 7 is a perspective view viewed from the front in the vicinity of the throttle grip.

Fig. 8 is a block diagram showing a throttle control system.

[0012] Fig. 1 to Fig. 8 show examples of the present invention. Fig. 1 is a side view of a principal portion of a

motorcycle; Fig. 2 is a plan view, viewed from the direction of an arrow 2 in Fig. 1 in a state in which an air cleaner is omitted; Fig. 3 is a front view of an intake air control device viewed from the direction of an arrow 3 in Fig. 2; Fig. 4 is a cross-sectional view taken along the line 4-4 in Fig. 3; Fig. 5 is a vertical cross-sectional view of a steering handle in the vicinity of a throttle grip; Fig. 6 is a cross-sectional view taken along the line 6-6 in Fig. 5; Fig. 7 is a perspective view viewed from the front in the vicinity of the throttle grip; and Fig. 8 is a block diagram showing a throttle control system.

[0013] In Fig. 1 and Fig. 2, a vehicle body frame F of a motorcycle as a saddle type vehicle includes a head pipe 11 at a front end thereof, a pair of left and right main frames 12... bifurcated from the head pipe 11 to the left and right and obliquely extending rearward and downward, pivot plates 13... connected to rear portions of the both main frames 12..., and down pipes 14... bifurcated to the left and right under the both main frames 12..., connected to the head pipe 11 and obliquely extending rearward and downward at an angle steeper than the both main frames 12....

[0014] An engine body 15 configured as a horizontally opposing type having six cylinders including three cylinders each extending in the fore-and-aft direction of the motorcycle arranged on both left and right sides is mounted to the vehicle body frame F so as to be positioned downwardly of the both main frames 12..., and the engine body 15 is supported by a midsection of the main frames 12..., the pivot plates 13... and the down pipes 14....

[0015] An air cleaner 16 is mounted to the vehicle body frame F at a position above the engine body 15, and an air intake path forming body 18 which forms a pair of air intake paths 17, 17 arranged on the left and right direction of the vehicle body frame F is arranged between the air cleaner 16 and the engine body 15. An upper portion of the air intake path forming body 18 is connected to a lower portion of the air cleaner 16 so that upstream ends of the both air intake paths 17... communicate with the interior of a purification chamber (not shown) in the air cleaner 16. An intake manifold 22A having three intake pipes 19A, 20A, 21A which commonly communicate with one of downstream ends of the both air intake paths 17... and an intake manifold 22B having three intake pipes 19B, 20B, 21B which commonly communicate with the other downstream end of the both air intake paths 17... are connected to a lower portion of the air intake path forming body 18, and the respective intake pipes 19A to 21A, 19B to 21B provided by the intake manifolds 22A, 22B are connected to left and right cylinder heads 23... provided by the engine body 15.

[0016] Referring also to Fig. 3 and Fig. 4, a valve shaft 24 extending in the left and right direction of the vehicle body frame F across the both air intake paths 17, 17 is rotatably supported by the air intake path forming body 18, and butterfly-shaped throttle valves 25, 25 for controlling the opening of the both air intake paths 17... are fixed to the valve shaft 24. In addition, an actuator 26 for driving to rotate the valve shaft 24 is connected to an end of the valve shaft 24.

[0017] Referring specifically to Fig. 4, the actuator 26 includes a valve shaft driving electric motor 28 having an axial line of rotation extending in parallel with an axial line of the valve shaft 24 and a decelerating gear mechanism 29 for decelerating the rotational power of the valve shaft driving electric motor 28 and transmitting the same to an end of the valve shaft 24, and the valve shaft driving electric motor 28 is stored and supported in a storage recess 30 provided in the air intake path forming body 18 in parallel with the axial line of the valve shaft 24. The air intake path forming body 18 is provided with a cover 33 for covering the actuator 26 mounted thereon and a throttle opening sensor 34 is stored in the cover 33 so that the throttle opening sensor 34 for detecting the opening of the throttle valves 25... that is, the rotational position of the valve shaft 24 is connected to an end of the valve shaft 24.

[0018] The valve shaft driving electric motor 28 is arranged between the both main frames 12... in the vehicle body frame F in top view obtained by viewing the motorcycle from above as clearly shown in Fig. 2, and is arranged forwardly of the valve shaft 24 along the fore-and-aft direction of the motorcycle. The engine body 15 is mounted to the vehicle body frame F in a state in which a crank axial line CC extends along the fore-and-aft direction of the motorcycle. An axial line C1 of the valve shaft 24 and an axial line of rotation C2 of the valve shaft driving electric motor 28 are arranged on an imaginary line SL arranged above the engine body 15 in substantially parallel with the crank axial line CC in side view obtained by viewing the motorcycle from the side.

[0019] In Fig. 5 to Fig. 7, a bar-shaped steering handle 35 is steerably supported by the head pipe 11 at the front end of the vehicle body frame F, and a throttle grip 36 is mounted to a right end portion of the steering handle 35 so as to enable a rider to grip and rotate. In addition, in order to cause the rotational movement of the valve shaft 24 rotatably supported by the air intake path forming body 18 to be fed back to the throttle grip 36, a grip driving electric motor 37 which is moved by the amount of rotation of the valve shaft 24, that is, according to a detected value of the throttle opening sensor 34, is disposed on the steering handle 35, and is interlocked and connected to the throttle grip 36.

[0020] The grip driving electric motor 37 is mounted to the steering handle 35 by a mounting member 38 so as to have an axial line of rotation in parallel with an axial line of rotation of the throttle grip 36. On the other hand, a rotating frame 39 as a rotating member is mounted to the steering handle 35 so as to cover an inner end portion of the throttle grip 36, and be capable of rotating about the identical axial line to the throttle grip 36, so that the rotational power of the grip driving electric motor 37 is transmitted to the rotating frame 39 via a transmission gear mechanism 40. In other words, the grip driving electric motor 37 is interlocked and connected to the rotating

frame 39.

[0021] A return spring 48 (see Fig. 5) which urges the throttle grip 36 in the throttle closing direction indicated by an arrow 43 in Fig. 6 is provided between the throttle grip 36 and the steering handle 35. The throttle grip 36 is integrally provided with an arm portion 41 projecting in the radially outward direction within the rotating frame 39, and a pressing piece 44 which can rotate the throttle grip 36 in the throttle opening direction indicated by an arrow 42 in Fig. 6 by coming into abutment with the arm portion 41 is movable mounted to the rotating frame 39. A lost motion spring 45 whose spring load is set to a value larger than that of the return spring 48 is provided between the rotating frame 39 and the pressing piece 44 in a contracted state. A recess 39a for allowing the rotational movement of the arm portion 41 away from the pressing piece 44 when the throttle grip 36 in a state in which the arm portion 41 is in abutment with the pressing piece 44 is rotated in the throttle opening direction 42 is provided on an inner surface of the rotating frame 39.

[0022] In this manner, when the rotating frame 39 is driven to rotate in the throttle opening direction 42 by the grip driving electric motor 37 in a state in which no operating load is not applied to the throttle grip 36 by the rider, the arm portion 41 is pressed by the pressing piece 44, and the throttle grip 36 rotates in the throttle opening direction 42. Therefore, when the rotating frame 39 is driven to rotate in the throttle closing direction 43 by the grip driving electric motor 37, the throttle grip 36 urged to rotate by the return spring 48 rotates in the throttle closing direction 43 while following the rotation of the rotating frame 39 so as to bring the arm portion 41 into abutment with the pressing piece 44. In other words, the rotating frame 39 which rotates about the identical axial line to the throttle grip 36 by transmission of a power from the grip driving electric motor 37 is mounted to the steering handle 35 so as to cause the throttle grip 36 to follow the rotation of the rotating frame 39.

[0023] A cancel switch 46 for detecting that the throttle grip 36 is rotated in the throttle closing direction 43 with respect to the rotating frame 39 is mounted to the rotating frame 39. The cancel switch 46 is provided with a detection shaft 47 opposing the pressing piece 44 from the opposite side from the arm portion 41 of the throttle grip 36. In this manner, when the throttle grip 36 rotates toward the side of pressing the pressing piece 44 by the arm portion 41 and compressing the lost motion 45 that is, in the throttle closing direction 43, with respect to the rotating frame 39, the pressing piece 44 comes into abutment with the detection shaft 47 and the cancel switch 46 changes the switching mode.

[0024] The amount of rotation of the throttle grip 36 is detected by a throttle operating amount sensor 49, and the throttle operating amount sensor 49 is mounted to the steering handle 35 together with the grip driving electric motor 37 with the mounting member 38. The throttle operating amount sensor 49 and the inner end of the throttle grip 36 are connected, for example by a gear-type interlocking/connecting mechanism 50.

[0025] In Fig. 8, the movement of the valve shaft driving electric motor 28 in the actuator 26 is controlled by a control unit 52, and a signal from the throttle opening sensor 34, the throttle operating amount sensor 49, the cancel switch 46, a vehicle speed sensor 53, an intake air pressure sensor 54, an intake air temperature sensor 55, and an automatic cruise selection switch 56 for switching the motorcycle between the automatic cruising state and the non automatic cruising state are supplied to the control unit 52.

[0026] In this manner, in the state in which the automatic cruise selection switch 56 selects the non automatic cruising state, in response to the supply of the amount of rotation of the throttle grip 36 when the rider of the motorcycle rotates the throttle grip 36 from the throttle operating amount sensor 49, the control unit 52 controls the movement of the valve shaft driving electric motor 28 so as to achieve the throttle opening according to the operating amount of the throttle.

[0027] When the automatic cruise selection switch 56 selects the automatic cruising state, the control unit 52 controls the movement of the valve shaft driving electric motor 28 so as to control the throttle opening while considering the intake air pressure and the intake air temperature so as to maintain the vehicle speed obtained by the vehicle speed sensor 53 when the automatic cruise selection switch 56 is switched.

[0028] In such the automatic cruising state, when the rider rotates the throttle grip 36 in the throttle closing direction 43, the pressing piece 44 is pressed by the arm portion 41 against a spring force of the lost motion spring 45, and hence the detection shaft 47 is pressed by the pressing piece 44. Therefore, the switching mode of the cancel switch 46 is changed, whereby the control unit 52 releases the automatic cruising state according to the change of the switching mode.

[0029] The operation of this example will be described now. The vehicle body frame F includes the head pipe 11 at the front end thereof and the pair of main frames 12... bifurcated from the head pipe 11 to the left and right and extending rearward, the actuator 26 including the valve shaft driving electric motor 28 which can demonstrate the power to rotate the valve shaft 24 is connected to the end of the valve shaft 24 extending in the left and right direction of the vehicle body frame F and rotatably supported by the air intake path forming body 18, and the valve shaft driving electric motor 28 having the axial line of rotation C2 which extends in parallel with the axial line C1 of the valve shaft 24 is arranged between the both main frames 12... in top view obtained by viewing the motorcycle from above. Therefore, the valve shaft driving electric motor 28 which constitutes a part of the actuator 26 can be protected by surrounding the pair of left and right main frames 12....

[0030] With the valve shaft driving electric motor 28 arranged forwardly of the valve shaft 24 along the fore-and-aft direction of the motorcycle, the valve shaft driving

electric motor 28 is effectively cooled by traveling wind of the motorcycle, and generation of a performance deterioration phenomenon resulted from heat can be prevented so that the operability of the valve shaft driving electric motor 28 can be increased.

[0031] In addition, the engine body 15 configured into a horizontal opposed type is mounted to the vehicle body frame F in a posture with the crank axial line CC extending along the fore-and-aft direction of the motorcycle, and the axial line C1 of the valve shaft 24 and the axial line of rotation C2 of the valve shaft driving electric motor 28 are arranged on the imaginary line SL arranged above the engine body 15 in substantially parallel to the crank axial line CC in side view obtained by viewing the motorcycle from the side. Therefore, the intake air control device can be arranged in the vicinity of an upper surface of the engine body 15, and hence an air intake system can be downsized.

[0032] Since the grip driving electric motor 37 which is moved by the amount of movement according to the amount of rotation of the valve shaft 24 in association with the movement of the actuator 26 is disposed on the steering handle 35 and is interlocked and connected to the throttle grip 36, when feeding back the rotational movement of the valve shaft 24 driven by the valve shaft driving electric motor 28 to the throttle grip 36, the cable is not necessary and hence laying of the cable is not necessary.

[0033] In response to the selection of the automatic cruising state by the automatic cruise selection switch 56 for switching the automatic cruising state and the non automatic cruising state, the control unit 52 controls the movement of the valve shaft driving electric motor 28 so as to maintain the vehicle speed at a constant value. Therefore, by selecting the automatic cruising state by the automatic cruise selection switch 56, the motorcycle can be traveled at a constant vehicle speed and, in addition, the loading state of an internal combustion engine during the automatic cruising can be recognized by the rotation of the throttle grip 36, whereby a desirable feeling of travel can be obtained.

[0034] In addition, the rotating frame 39 which rotates about the identical axial line to the throttle grip 36 by the transmission of the power from the grip driving electric motor 37 is mounted to the steering handle 35 so as to cause the throttle grip 36 to follow the rotation of the rotating frame 39, the cancel switch 46 for detecting that the throttle grip 36 is rotated in the throttle closing direction 43 with respect to the rotating frame 39 is mounted to the rotating frame 39, and the control unit 52 releases the automatic cruising state in response to detection of relative rotation of the throttle grip 36 in the throttle closing direction 43 in the automatic cruising state. Therefore the rotation of the throttle grip 36 for releasing the automatic cruising state can be detected by the cancel switch 46 in good response in the structure without the interposition of the cable or the like.

[0035] Although the example of the present invention has been described thus far, the present invention is not limited to the embodiment described above, and various modifications in design can be performed without departing from the invention stated in Claims.

[0036] For example, the present invention can be implemented widely not only in the motorcycles, but also in the saddle type vehicles.

Object: In a saddle type vehicle in which a valve shaft to which a throttle valve is secured is rotatably supported on an air intake path forming body, and an actuator having a valve shaft driving electric motor which is moved in response to the turning operation of a throttle grip is connected to an end of the valve shaft, so that the rotational movement of the valve shaft is fed back to the throttle grip, laying of a cable is not necessary, and the rotational movement of the valve shaft driven by the valve shaft driving electric motor can be fed back to the throttle grip.

Solving Means: A grip driving electric motor 37 which is moved by the amount of movement according to the amount of rotation of the valve shaft in response to the operation of the actuator is disposed on the steering handle 35, and is interlocked and connected to the throttle grip 36.

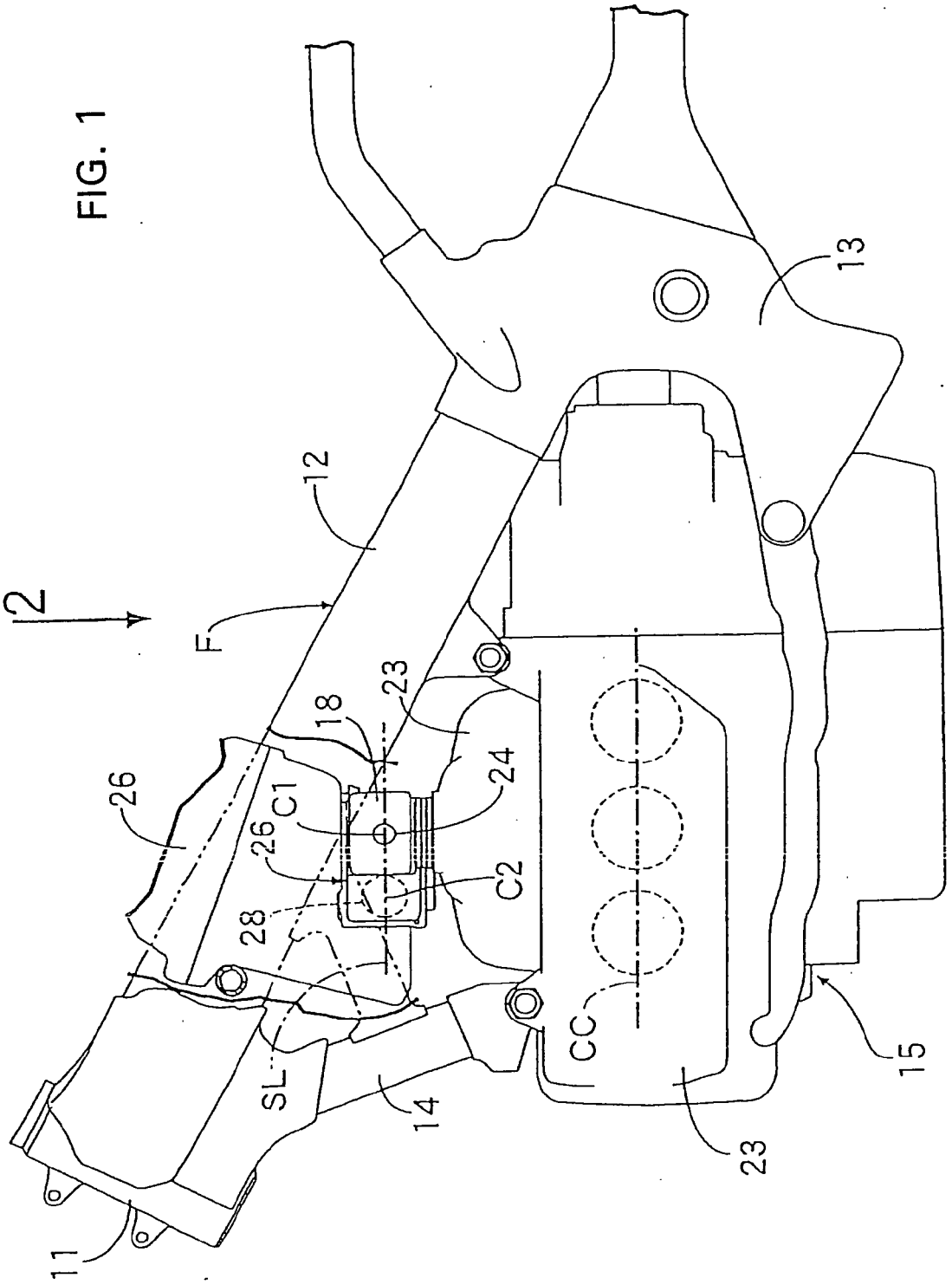
Claims

1. A saddle type vehicle comprising an air intake path forming body (18) that forms an air intake path (17), a valve shaft (24) to which a butterfly-shaped throttle valve (25) for controlling the opening of the air intake path (17) is secured, the valve shaft (24) being rotatably supported on the air intake path forming body (18), and an actuator (26) having a valve shaft driving electric motor (28) which is moved in response to the turning operation of a throttle grip (36) mounted to an end of a bar-shaped steering handle (35) so as to be capable of turning, the actuator (26) being connected to an end of the valve shaft (24) so as to rotate the valve shaft (24), so that the rotational movement of the valve shaft (24) is fed back to the throttle grip (36),
   characterized in that a grip driving electric motor (37) that is moved by the amount of movement according to the amount of rotation of the valve shaft (24) in response to the operation of the actuator (26) is disposed on the steering handle (35) and is interlocked and connected to the throttle grip (36).

2. The saddle type vehicle according to Claim 1 comprising: an automatic cruise selection switch (56) for switching between an automatic cruising state and a non automatic cruising state, and a control unit (52) for controlling the movement of the valve shaft driving electric motor (28) so as to maintain the vehicle speed constant in response to selection of the automatic cruising state by the automatic cruise selection switch (56).

3. The saddle type vehicle according to Claim 2 comprising a rotating member (39) that rotates about an identical axial line to the throttle grip (36) by transmission of a power from the grip driving electric motor (37), the rotating member (39) being mounted to the steering handle (35) so as to cause the throttle grip (36) to follow the rotation of the rotating member (39), a cancel switch (46) mounted to the rotating member (39), the cancel switch (46) detecting that the throttle grip (36) is rotated in a throttle closing direction (43) with respect to the rotating member (39), wherein the control unit (52) releases the automatic cruising state in response to the detection of the relative rotation of the throttle grip (36) in the throttle closing direction (43) by the cancel switch (46) in the automatic cruising state.

FIG. 1



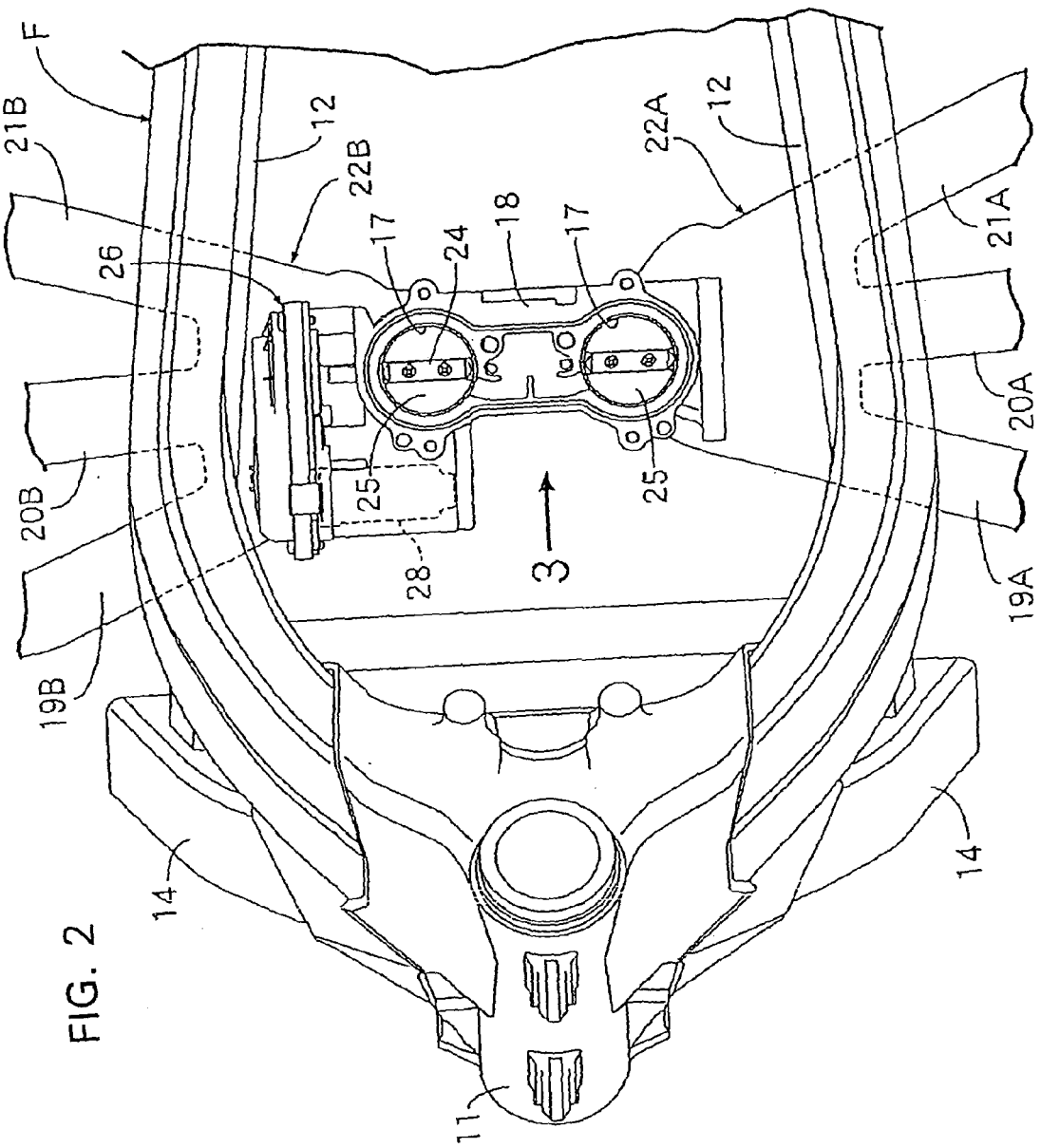

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FIG. 2

FIG. 3

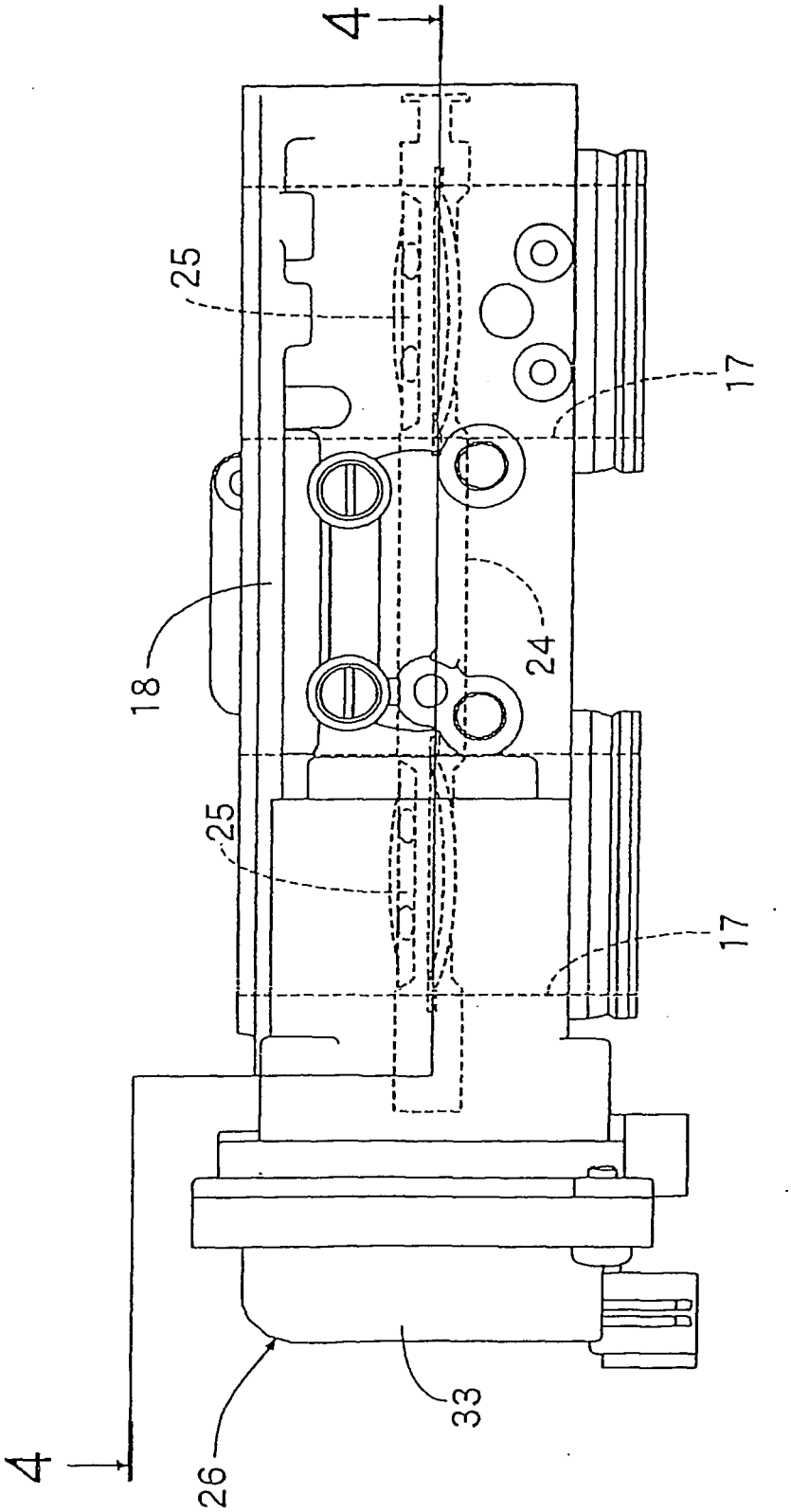


FIG. 4

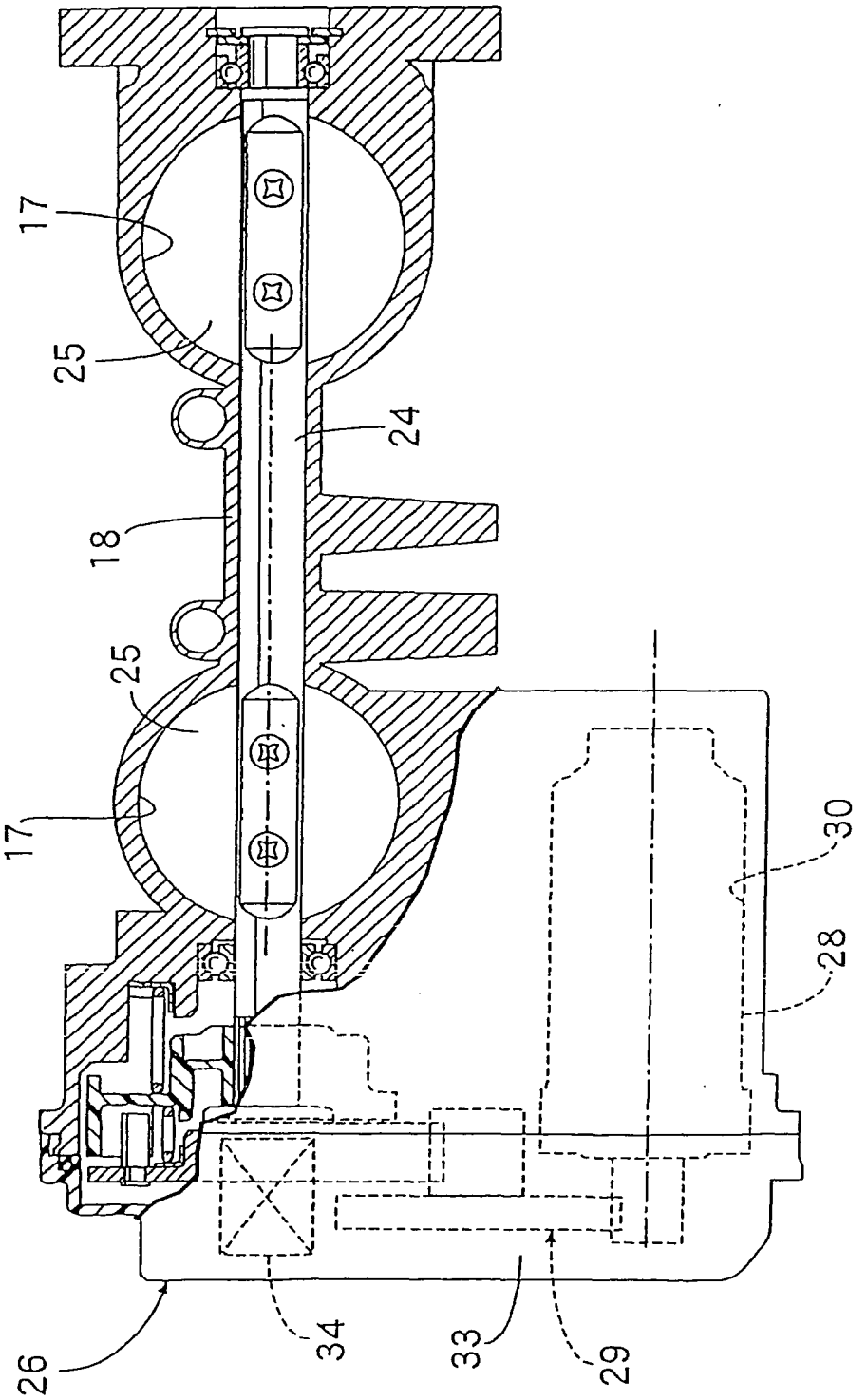


FIG. 5

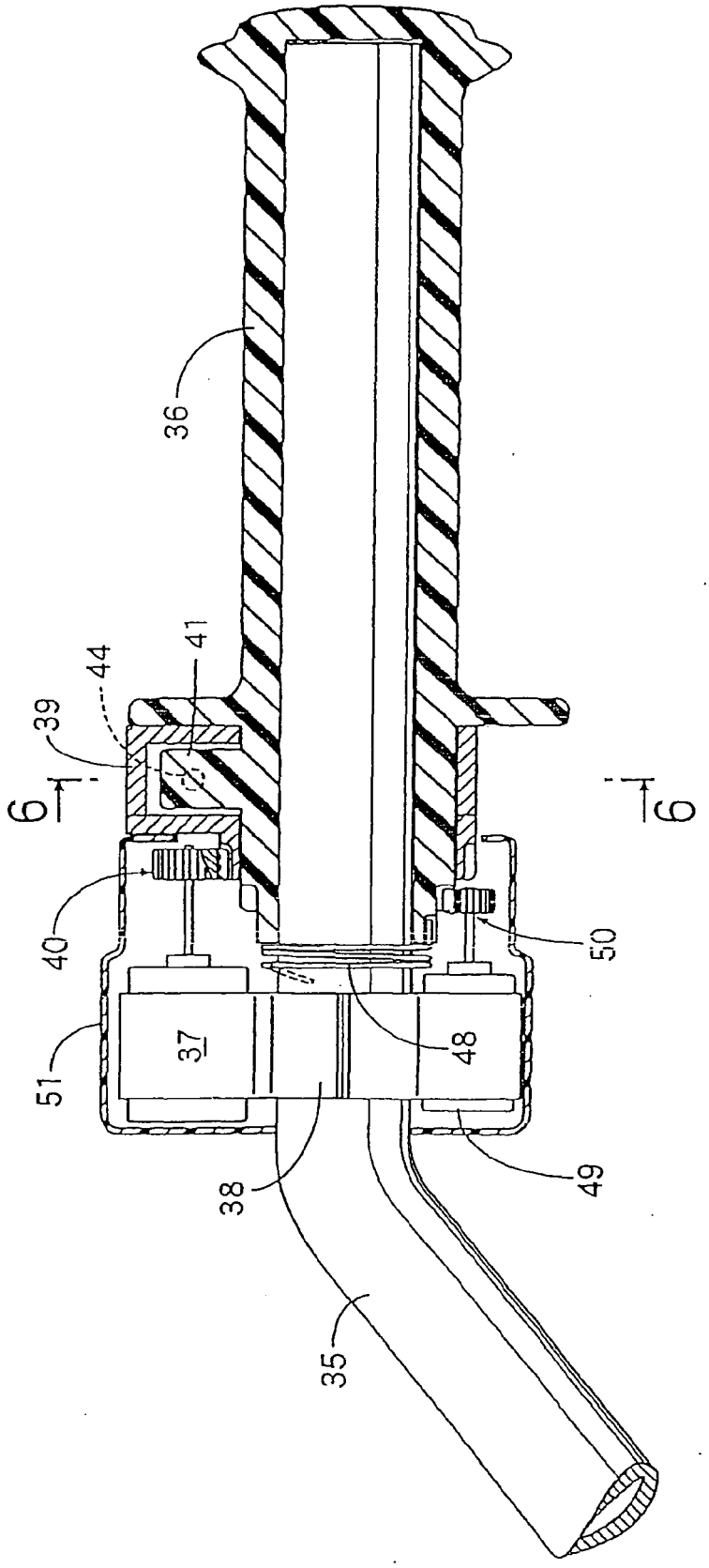


FIG. 6

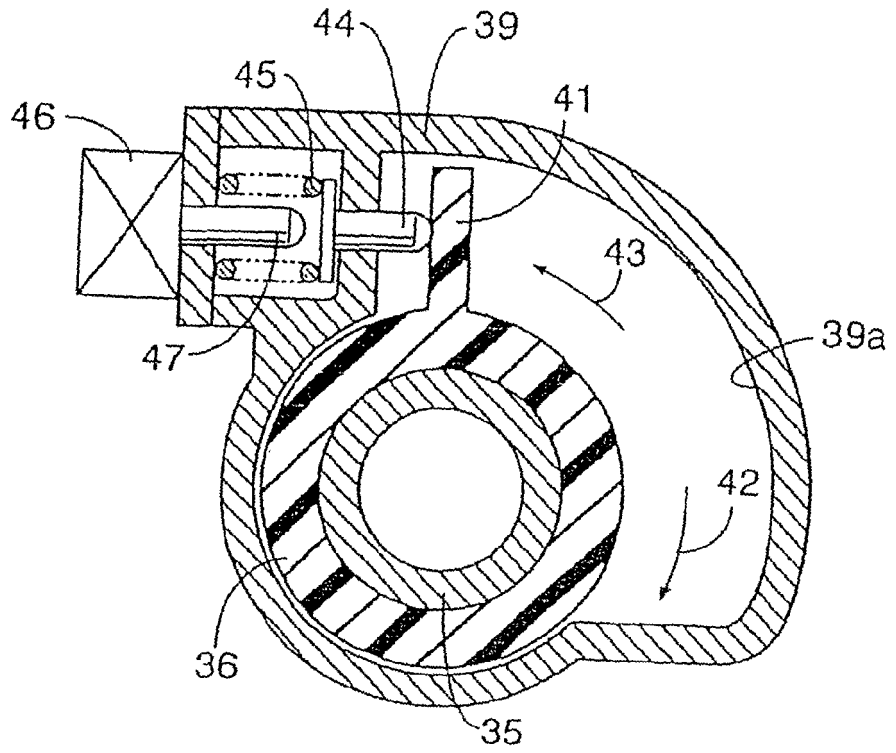


FIG. 7

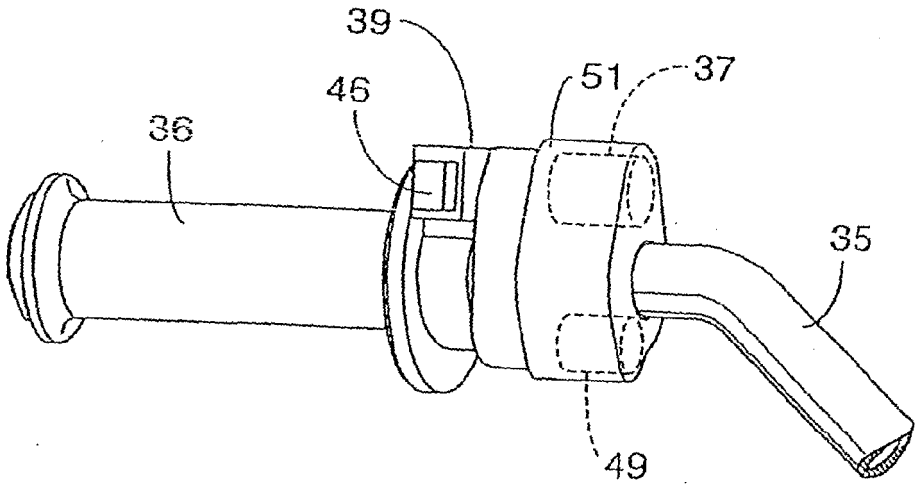
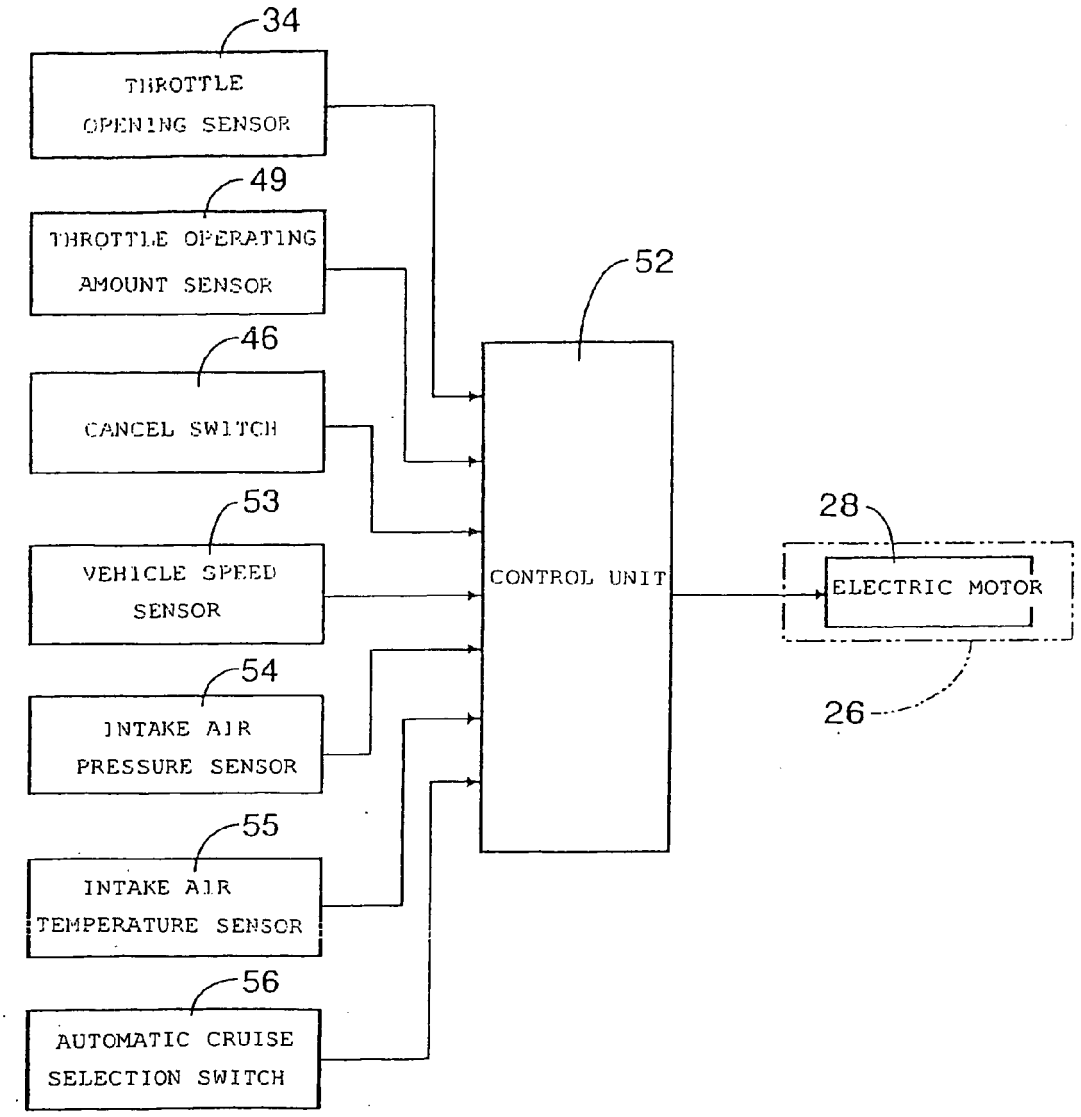


FIG. 8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INTAKE AIR PRESSURE SENSOR
55
INTAKE AIR TEMPERATURE SENSOR
56
AUTOMATIC CRUISE SELECTION SWITCH
52
CONTROL UNIT
28
ELECTRIC MOTOR
26

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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